

TORNADOES IN WISCONSIN, APRIL, 1929

By W. P. STEWART

[Weather Bureau Office, Milwaukee, Wis.]

(Condensed by the Editor)

In this month three tornadoes were observed under rather unusual meteorological conditions. Two occurred late in the afternoon of the 5th, one of which traversed the State of Wisconsin from Pierce County to Iron County, a distance of 187 miles, at a speed of 68 miles an hour.

This tornado occurred in a belt of thunder and wind storms about 250 miles in width. Pressure in this belt ranged from 29.50 to 29.70 inches from a central low pressure of 28.92 inches at Moorehead, Minn. The morning temperature was quite a bit below 70° at the morning observation. The path of great destruction varied in width from 100 to 1,200 feet, but there was more or less damage over a width of 10 to 20 miles from the path of great destruction; evidently the destruction outside of the central path was due to the storm winds of the cyclone which, as above noted, had a central pressure below 29 inches.

The third tornado entered Wisconsin from Iowa in the neighborhood of Dubuque. It occurred on the 6th and

551.578.7 (73)

HAIL APRIL 21, 1929, IN KENTUCKY, ILLINOIS AND LOUISIANA

By J. L. KENDALL, W. E. BARRON, and R. A. DYKE, of the Weather Bureau stations at Louisville, Cairo, and New Orleans, respectively

HAIL IN LOUISVILLE, KENTUCKY

A hailstorm of unusual character and causing heavy damage visited the locality immediately northwest of this station from 2:30 to 2:45 p. m. on April 21, 1929. The center of the heaviest hail was over New Albany, Ind., where stones ranging from 2 to 3 inches in diameter fell with considerable frequency. A large quantity of smaller hail, from the size of a pea to an inch in diameter, also occurred. Near the end of the storm the ground was nearly covered with ice.

The area reached by the very large stones extended east to Jeffersonville, Ind., where the writer measured stones that were 2 to 2½ inches in diameter; and also included the northwest quarter of Louisville. The frequency of the large stones diminished as the distance from eastern New Albany increased. At Jeffersonville they fell on the average about 1 to 2 feet apart, sometimes 3 feet.

The area reached by hail of smaller size extended for about 10 miles north of Louisville, and for about 20 miles in a southerly direction; but no hail of the size given above has been reported in these outside districts. In general the largest hail in those sections was about 1 inch in diameter. Hail also occurred at many other places in the State of Kentucky and in southern Indiana. From reports received it seems that hail was exceptionally widespread in this section on that day.

There were two kinds of large hailstones, apparently formed by different methods. One was of the usual type, in which concentric layers of ice and snow make up the stone and the appearance of the mass is white. These were as large as an inch in diameter at my place in Jeffersonville, Ind. The other stones were apparently made up of a mass of smaller stones frozen together, and were nearly all ice. The rim of these stones was jagged, where smaller stones had frozen to the central mass and projected. Across the central mass of ice, without includ-

was associated with a cyclonic storm centered over northeast Colorado. In this case, also, there was a narrow belt of thunderstorms that stretched from eastern Kansas to Lake Michigan. The details of these tornadoes are given in the table on pages 165-166.

Three photographs of the River Falls tornado cloud were made by Mr. Claire Bartosh, who lives on a farm near River Falls. From the prints supplied through Mr. C. G. Stratton, cooperative observer at that station, the reproductions of Figure 1 were made. The first photograph was made at 5:50 p. m., April 5, 1929, and the remaining two within the space of 5 minutes thereafter. The lack of detail in the foreground is due to the fact that it is plowed ground. Between the plowed ground and the tornado cloud is the river valley.

The original prints are 2 by 3 inches and they have been slightly enlarged in the reproduction. The interesting feature in them is the change in the funnel cloud that took place in 5 minutes.

ing these projections, they measured 2 to 2½ inches at Jeffersonville. According to reports, they were somewhat larger at New Albany.

These stones were flat in shape, with the shorter diameter about 1 inch or slightly more. Around the rim of the stone the radial lines of the smaller stones could be seen embedded in the mass of ice. The shape of the smaller stones, of which the mass appeared to be built up, could be plainly seen in the outer one-third of the diameter of the mass. The lines of these stones radiated outward from the center of the mass, not always regularly but comparatively so. From these lines and the stones frozen on the rim and projecting, the mass seemed to be made up of stones about twice as long as they were thick and somewhat cylindrical in shape but with flattened sides. These were the outstanding features of the stones, but it is not to be understood that they were regular in shape for they exhibited marked irregularities in the way of protuberances on the flat sides and rim. The small stones that made up the mass contained much less snow than the usual hailstone. They were almost solid, clear ice. This fact accounts in part for the enormous damage caused by these stones, for they were almost as heavy as a piece of solid ice of the same size.

The heaviest damage was to greenhouses in New Albany and between New Albany and Jeffersonville. This loss alone was estimated at \$60,000 to \$70,000. Auto tops were penetrated, hoods and fenders were dented, holes were cut in metal roofs, and shingle roofs were badly damaged. Hundreds of windows were broken. The entire damage in New Albany, Jeffersonville, and the district lying between, was placed at about \$100,000. No estimate could be obtained of the damage in the northwest part of Louisville, but it is believed that \$10,000 will cover most of it. The damage in that district was mostly to automobiles, windows, and occasional roofs.—
J. L. K.

HAIL IN LOWER OHIO VALLEY

A hailstorm of wide extent occurred on Sunday afternoon, April 21, 1929, in connection with a series of depressions that at morning observation covered the Ohio and lower Mississippi Valleys with the lowest pressure at Cairo, Ill., 29.69 inches, reduced to sea level. The hail area in this vicinity covered most of Alexander and Pulaski Counties and parts of Union and Johnson Counties in Illinois, parts of Mississippi and Scott Counties of Missouri, and most of Ballard and McCracken Counties, with parts of Carlisle and Graves Counties in Kentucky. There was no hail at Cairo, the nearest being about 5 miles north and 5 miles east and southeast of station.

Hailstones over the area varied in size from one-fourth inch to $2\frac{1}{4}$ inches in diameter, over much of the area more than one-half inch. The area of heavy hail (1 inch or more in diameter) was apparently about 4 miles wide and 30 miles long, stretching from near Olive Branch and Miller City eastward across Alexander and Pulaski Counties, thence southeastward across Ballard County, Ky., diagonally to Lovelaceville. Hailstones that fell at Roth Station, 2 miles west of Cache, Alexander County, Ill., brought to Cairo, in a glass jar, were disk shaped and measured 2 inches in diameter 2 hours after falling. The time when the storm broke ranged from 2:30 p. m. at the western end of the path to 4:30 p. m. at the eastern end. At some places the fall is reported to have lasted 30 minutes.

Damage to property was confined mostly to composition roofs, automobile tops, and hotbeds; very little to windows, as the wind was not strong; approximate loss, \$30,000; \$20,000 in Illinois and \$10,000 in Kentucky. Damages to truck crops, berries, and tree fruits can not be determined accurately, but will probably equal the amounts of property damage in the two States. No appreciable damage was reported in the Missouri area.—*W. E. B.*

HAIL IN NORTHEAST LOUISIANA

During the afternoon of April 21, 1929, the eastward movement of a trough of low pressure was attended by thundershowers in northern Louisiana and violent convectional action accompanied the shifting of the wind from southerly to westerly, a tornado occurring in one locality and a remarkable fall of hail in another.

At about 3:45 p. m., a tornado, moving eastward or slightly south of east, over a path 18 to 50 yards wide and 8 miles long, passed near Oak Ridge, in Morehouse

Parish. A distinct funnel cloud, described as "very small at bottom and not spreading out until very high," was observed. The tornado demolished a few houses about 2 miles south and southwest of Oak Ridge, killing two persons and severely bruising a few others. The property damage is estimated at \$7,550.

As the squall line moved farther eastward a hailstorm occurred in the vicinity of Tallulah, about 38 miles southeast of Oak Ridge, between 4:30 and 5 p. m. The hailstones, falling over an area about 20 miles wide (length not given), were scattering but remarkably large. Mr. G. L. Smith, of Tallulah, reports:

"Authentic reports have been received of a few stones measuring 4 by 4 by 6 inches. A few very large pieces of ice fell before the main storm began. The falling of large stones lasted less than 10 minutes and was followed by a little rain for about 30 minutes. Most of the stones were round and very compact. They remained on the ground for a good while after the storm had passed. The small amount of damage was no doubt due to the fact that the hailstones were not nearly so numerous as in the usual hailstorm. A little damage occurred to roofs, car tops, and glass structures. The accompanying photograph (see plate facing page 155) illustrates the size of the hailstones."—*R. A. D.*

DISCUSSION

On the morning of the 21st the pressure distribution was about as follows: An anticyclone of considerable intensity and geographic extent was centered along the west shore of Hudson Bay, the true center being a small distance inland from the mouth of Nelson River. A trough of low pressure stretched from Cape Cod to eastern Kansas and a second trough oriented northwest/southeast covered the region between southern Alberta and northern Wyoming. These two troughs were in the proper position to give showers and thunderstorms in the same 24 hours from the Atlantic to the Pacific. A single thunderstorm was occurring on the morning of the 21st in Massachusetts, thence westward there was a break in their continuity, none occurring until the Ohio Valley was reached. Here they were quite general and the area covered by them reached to eastern Kansas on the west. As the day wore on they became much more general and of greater severity in spots. In the Ohio Valley a house was blown down and the inmates suffered injury. Hail was also of general occurrence along the line of the trough from the Ohio Valley to the Atlantic.—*Ed.*

SQUALLS WITH RISING BAROMETER AT ROSEBURG, OREGON

551.515:551.54 (795)

By EDGAR H. FLETCHER

[Weather Bureau Office, Roseburg, Oreg., April 15, 1929]

It frequently has been observed here in the late winter and early spring that with rising barometer and clearing weather the advancing cold air mass with the resultant steep vertical temperature gradient, causes a succession of light squalls from the west or northwest accompanied by precipitation in the form of showers (rain or snow), and usually by light hail, but without thunder and lightning. Thus there is during the greater part of the day under such conditions, a frequent alternation of sunshine and storm, with decidedly cool weather prevailing.

The small ice pellets accompanying these extremely local showers should be classified as hail, rather than sleet; for an inversion of temperature is necessary for the formation of true sleet, which usually occurs with the approach of a warm front during the colder season of the year.

These intermittent showers, occurring every hour or two during the warmer part of the day, are of short duration, usually lasting less than 30 minutes. A steep vertical temperature gradient no doubt exists at the time, and it is probable that the convectional activity is confined to a comparatively shallow layer of the air. If the maximum temperature for the day is below 50°, it is not unusual to observe rain, hail, snow, and probably sleet within an interval of 5 or 10 minutes, but the precipitation is always light. Often the fine ice pellets resemble sleet so closely that they are recorded as such.

It is evident that the Coast Range plays an important part in the formation of these local disturbances, since the air is forced upward to about the 2,000-foot level in